Remarks

Claims 1-25 are pending. The Applicants have canceled claims 26-100 without prejudice.

The Office action dated January 26, 2005 ["Office action"] rejects claims 1-3 and 7 as being unpatentable over U.S. Patent No. 6,160,846 to Chiang et al. ["Chiang '846"]. The Office action rejects claims 10, 12-17, and 19 as being unpatentable over U.S. Patent No. 5,414,796 to Jacobs et al. ["Jacobs"]. The Office action rejects claim 4 as being unpatentable over Chiang '846 in view of U.S. Patent No. 5,623,424 to Azadegan et al. ["Azadegan"]. The Office action rejects claims 5, 6, 11, 18, and 22-25 as being unpatentable over Chiang '846 in view of Jacobs. The Office action rejects claims 8 and 9 as being unpatentable over Chiang '846 in view of U.S. Patent No. 6,278,735 to Mohsenian ["Mohsenian"]. The Office action rejects claims 20 and 21 as being unpatentable over U.S. Patent No. 6,243,497 to Chiang et al. ["Chiang '497"] in view of Jacobs. The Applicants respectfully disagree with the rejections of claims 1-25.

I. Election/Restriction.

The Applicants have reviewed the restriction requirement as stated by the Examiner in the Office action. [Office action, pages 2-7.] The Applicants respectfully disagree with the Examiner's characterizations of the claims and groups, and with the Examiner's reasoning in explaining the restriction requirement.

The Applicants confirm, however, that the Applicants have elected the claims of Group 1 (claims 1-25). Claims 26-100 have been canceled without prejudice.

II. Form 1449s for Previously Filed Information Disclosure Statements.

The Applicants filed Information Disclosure Statements on May 1, 2002 (with a 4-page Form 1449) and January 13, 2005 (with a 3-page Form 1449). The Examiner did not initial U.S. Patent No. 6,115,689 on the Form 1449 for the May 1, 2002 IDS. Please provide a fully initialed Form 1449 for each of these two IDSs.

III. Chiang '846 and Jacobs.

In the interest of reaching a shared understanding of the disclosures of Chiang '846 and Jacobs, the Applicants make the following observations.

A.   Chiang '846.

Chiang '846 describes video encoding for a constant capacity channel. Specifically,

Chiang '846 indicates:

> In practical applications for encoders, the communication channel through which
> the coded data is to be transmitted is generally a constant capacity channel. As
> such, the encoder requires a mechanism to regulate the output bit rate to match the
> channel rate with minimum loss of signal quality.

[Chiang '846, 4:20-24; 1:9-10.] The encoder includes a discrete cosine transform ["DCT"]

module 160 [Chiang '846, 7:22-35], and DCT coefficients are quantized.

In one section, Chiang '846 describes a rate control module 130 that "selects a quantizer

scale for each macroblock to maintain the overall quality of the video image while controlling

the coding rate." [Chiang '846, 8:57-59.] According to Chiang '846, "an optimal quantization

scale ratio is maintained for successive macroblocks to produce a uniform visual quality over the

entire picture." [Chiang '846, 8:61-63.]

The rate control module 130 derives a predicted number of bits from a rough estimate of

the complexity of a specific type of picture, and with this the encoder calculates a quantizer scale

for a macroblock. [Chiang '846, 8:64-9:4.] Then, "the quantizer scale is optionally refined by a

modifier which is derived to meet a constraint that requires a constant visual quality to be

maintained for the entire picture." [Chiang '846, 9:8-11.] Specifically, the encoder calculates

the modifier by dividing a projected number of bits by the target number of bits for the picture,

where the projected number of bits depends on human visual system weightings for the picture,

and where the human visual system weightings depend on spatial activity in the picture. [Chiang

'846, 11:31-12:35.] The human visual system weightings for all macroblocks in the picture are

"calculated prior to encoding." [Chiang '846, 11:67.]

In another section about a different embodiment, Chiang '846 describes rate control that

uses actual data resulting from the encoding process to directly compute the quantizer scale for

the next macroblock. [Chiang '846, 13:32-14:53.] The encoder encodes a macroblock with a

quantizer scale and calculates the "actual distortion between the corresponding original

macroblock of the input picture and the quantized macroblock." [Chiang '846, 14:8-15.] For

some number of iterations, the encoder repeats this for different target bit budgets for the

macroblock. [Chiang '846, 14:33-43.] The encoder then selects the target bit budget that produces the smallest distortion. [Chiang '846, 14:44-45.]

B.   Jacobs.

Jacobs describes a variable rate vocoder. [Jacobs, Abstract, 2:51-54.] The vocoder uses code excited linear prediction ["CELP"] in which the vocoder computes linear prediction coefficient ["LPC"] values for a frame. [Jacobs, 2:57-60.]

The LPC values are parameters for a short-term formant filter, "which performs short-term prediction of the speech waveform using a model of the human vocal tract." [Jacobs, 1:66-67.]   The vocoder converts the LPC values to a line spectral pair ["LSP"] representation for quantization, encoding, signaling, and interpolation. [Jacobs, 7:66-8:7, 8:21-26, 24:3-27.]

The vocoder determines the rate of a current frame, considering the current frame's energy, the previous estimate of background noise level, the previous rate, and rate commands from a controlling microprocessor. [Jacobs, 14:61-68.] A preliminary determination RT_p of the rate of the current frame is determined to be 1, 2, 4, or 8 kb/s by comparing the frame energy to three thresholds that depend on the previous estimate of background noise level. [Jacobs, 15:3-30.] "The preliminary rate RT_p may then be modified based on the previous frame final rate RT_r" [Jacobs, 15:31-32], which results in an intermediate rate RT_m. Then,

> the intermediate rate RT_m is further modified by rate bound commands from a microprocessor. If the rate RT_m is greater than the highest rate allowed by the microprocessor, the initial rate RT_i is set to the highest allowable value. Similarly, if the intermediate rate RT_m is less than the lowest rate allowed by the microprocessor, the initial rate RT_i is set to the lowest allowable value."

[Jacobs, 15:44-51.] The "highest rate" and "lowest rate" allowed by the microprocessor can be set for special rate control situations or for system resource management. [Jacobs, 15:52-59, 17:16-27, 38:28-39:24.] In addition, the vocoder:

> compares the previous frame LSP frequencies with the current frame LSP frequencies based on the sum of the square of the difference between the current and previous frame LSP frequencies. The resulting value is then compared with a threshold value for which if exceeded is an indication that an increase in rate is necessary to ensure high quality encoding of the speech. Upon exceeding the threshold value, logic 442 increments the initial rate by one rate level so as to provide an output of the final rate used throughout the encoder.

[Jacobs, 24:17-26.] LPC values (and their corresponding LSP values) depend on the spectral properties of the input signal. [Jacobs, 15:61-65, 23:6-10.] When LSP values change by more than a threshold amount in Jacobs, this indicates a change in spectral properties from the previous frame to the current frame, and the encoder increases rate for the current frame.

IV. Claims 1, 3, and 7 should be allowable.

The Office action rejects claims 1, 3, and 7 as being anticipated by Chiang '846. The Applicants respectfully disagree. Chiang '846 fails to teach or suggest at least one limitation of each of claims 1, 3, and 7.

Claim 1, as amended, recites, "the encoder adjusts quantization step size of the quantizing in view of a comparison of a target quality parameter for the block to a quality measurement for the block as quantized and reconstructed."

Chiang '846 describes selecting a quantizer scale for each macroblock to maintain the overall quality of a video image while controlling the coding rate. [Chiang '846, 4:22-42, 8:57-59.] Chiang '846 describes this as working "to produce a uniform visual quality over the entire picture." [Chiang '846, 4:40-41, 8:61-63.] Specifically, the encoder calculates a modifier for a macroblock that depends on human visual system weightings for the picture, where the human visual system weightings depend on spatial activity in the picture and are calculated prior to encoding. [Chiang '846, 11:31-12:35.]

Even if (for the sake of argument), the "uniform visual quality" in Chiang '846 is a "target quality parameter" (as in claim 1), the "uniform visual quality" is not involved in any comparison to a quality measurement for a block as quantized and reconstructed. The "modifier" in Chiang '846 depends on spatial activity in a picture [Chiang '846, 11:31-61], which is different than a quality measurement for a block as quantized and reconstructed. The "modifier" in Chiang '846 also depends on human visual system weightings "calculated prior to encoding" [Chiang '846, 11:67], which leads away from a quality measurement for a block as quantized and reconstructed. Chiang '846 does not teach or suggest the above-cited language of claim 1.

Chiang '846 describes a separate embodiment in which an encoder calculates actual distortion between an original macroblock and quantized macroblock. [Chiang '846, 13:32-

14:53.] This does not involve a comparison to a target quality parameter. Again, Chiang '846 does not teach or suggest the above-cited language of claim 1.

Claim 1 should be allowable.

Claims 2, 3, and 7 depend from claim 1 and therefore should be allowable. In view of the foregoing comments, the Applicants will not belabor the merits of the separate patentability of claims 2, 3, and 7. Claims 2, 3, and 7 should be allowable.

V.   Claims 10, 12-17, and 19 should be allowable.

The Office action rejects claims 10, 12-17, and 19 as being anticipated by Jacobs. The Applicants respectfully disagree. Jacobs fails to teach or suggest at least one limitation of each of claims 10, 12-17, and 19.

A.   Claim 10 should be allowable.

Claim 10, as amended, recites, "performing a frequency transform on plural time domain audio samples to produce a block of frequency coefficients," as well as "comparing a quality measure for the block to a quality target." According to claim 10, an encoder performs a frequency transform on time domain audio samples to produce a block of frequency coefficients, then performs subsequent comparisons for the block of frequency coefficients.

In contrast, Jacobs describes a vocoder that uses CELP, computing LPC values for a frame and converting the LPC values to an LSP representation. [Jacobs, 7:66-8:7.] Even if (for the sake of argument) the LSP frequencies were considered to be "frequency coefficients," the LSP frequencies are not produced from a frequency transform on time domain audio samples, as recited in claim 10. More fundamentally, Jacobs' CELP encoding uses a different encoding architecture than the encoding recited in claim 10.

Claim 10 also recites, "comparing a quality measure for the block to a quality target." According to claim 10, an encoder compares a quality measure for the block to a quality target.

In contrast, in Jacobs, the vocoder computes the sum of square differences ["SSD"] between the current frame's LSP frequencies and previous frame's LSP frequencies, then compares the resulting value with a threshold value. [Jacobs, 24:17-23.] The SSD value indicates the *extent of change* in LSP frequencies from the previous frame to the current frame. As such, the SSD value in Jacobs measures *similarity* from frame to frame. Regardless of the

quality of the current frame, if the LSP frequencies in the previous frame and current frame were identical, the SSD value would be zero. Or, regardless of the quality of the current frame, if the LSP frequencies in the previous frame and current frame were different, the SSD value would be non-zero. The SSD value in Jacobs is not a quality measure as recited in claim 10. Moreover, the SSD threshold value in Jacobs indicates a threshold change in LSP frequencies; it is not a quality target as recited in claim 10.

For any of these reasons, claim 10 should be allowable.

B.   Claim 12 should be allowable.

Claim 12 depends from claim 10 and should therefore be allowable.

In addition, claim 12 recites, "wherein a first quantization loop includes the quantizing and the comparing the quality measure, and wherein a second quantization loop de-linked from the first quantization loop includes the comparing the bit-count measure." As noted in the section V.A, Jacobs fails to teach or suggest, "comparing a quality measure for the block to a quality target." Jacobs is even further from teaching or suggesting this language of claim 12.

Claim 12 should be allowable.

C.   Claim 13 should be allowable.

Claim 13 depends from claim 10 and should therefore be allowable.

In addition, claim 13 recites, "wherein the quality target, the minimum-bits target, and the maximum-bits target are for the block." Jacobs describes rate bound commands from a microprocessor [Jacobs: 15:44-51], but does not describe the rate bound commands as being set per frame or other audio unit. Jacobs does not teach or suggest the above-cited language of claim 13.

Claim 13 should be allowable.

D.   Claim 14 should be allowable.

Claim 14 recites, "determining one or more target quality parameters, a first target quality parameter of the one or more target quality parameters indicating an acceptable audio quality" and "compressing audio information, wherein quantization of the audio information is based at least in part upon the first target quality parameter." According to claim 14, an encoder

determines a target quality parameter indicating an acceptable audio quality and compresses audio information, where quantization of the audio information is based at least in part upon the target quality parameter.

In contrast, in Jacobs, the vocoder computes the SSD between the current frame's LSP frequencies and previous frame's LSP frequencies, then compares the resulting value with a threshold value. [Jacobs, 24:17-23.] The SSD threshold value in Jacobs indicates a threshold change in LSP frequencies from the previous frame to the current frame. As such, the SSD threshold value in Jacobs relates to *similarity* from frame to frame. Regardless of the quality of the current frame, if the LSP frequencies in the previous frame and current frame were identical, the SSD value would be zero. Or, regardless of the quality of the current frame, if the LSP frequencies in the previous frame and current frame were different, the SSD value would be non-zero. The SSD threshold value in Jacobs is not a "target quality parameter … indicating an acceptable audio quality" as recited in claim 14.

Claim 14 should be allowable.

E.   Claim 15 should be allowable.

Claim 15 depends from claim 14 and should therefore be allowable.

In addition, claim 15, as amended, recites, "wherein the method further comprises performing a frequency transform on plural time domain audio samples, producing a block of frequency coefficients, wherein the audio information is the block of frequency coefficients."

In contrast, Jacobs describes a vocoder that uses CELP, computing LPC values for a frame and converting the LPC values to an LSP representation. [Jacobs, 7:66-8:7.] Even if (for the sake of argument) the LSP frequencies were considered to be "frequency coefficients," the LSP frequencies are not produced from a frequency transform on time domain audio samples, as recited in claim 15. More fundamentally, Jacobs' CELP encoding uses a different encoding architecture than the encoding recited in claim 15.

Claim 15 should be allowable.

F.   Claim 16 should be allowable.

Claim 16 depends from claim 14 and should therefore be allowable.

In addition, claim 16 recites, "the first target quality parameter, the first target bitrate parameter, and the second target bitrate parameter are for the block." Jacobs describes rate bound commands from a microprocessor [Jacobs: 15:44-51], but does not describe the rate bound commands as being set per frame or other audio unit. Jacobs does not teach or suggest the above-cited language of claim 16.

Claim 16 should be allowable.

G.   Claim 17 should be allowable.

Claim 17 depends from claim 14 and should therefore be allowable.

In addition, claim 17 recites, "quantizing the audio information," "computing a quality measure based upon the quantized audio information," and "comparing the quality measure to the first target quality parameter." As noted in the section V.D, Jacobs fails to teach or suggest a "target quality parameter ... indicating an acceptable audio quality." Jacobs is even further from teaching or suggesting the above-cited language of claim 17.

Claim 17 should be allowable.

H.   Claim 19 should be allowable.

Claim 19 depends from claim 14 and should therefore be allowable.

In addition, claim 19 recites, "in a first quantization loop, adjusting the quantization until satisfaction of the first target quality parameter," and "in a second quantization loop, adjusting the quantization until satisfaction of the first and second target bitrate parameters." As noted in the section V.D, Jacobs fails to teach or suggest a "target quality parameter ... indicating an acceptable audio quality." Jacobs is even further from teaching or suggesting the above-cited language of claim 19.

Claim 19 should be allowable.

VI.   Claim 4 should be allowable.

The Office action rejects claim 4 as being unpatentable over Chiang '846 in view of Azadegan. The Applicants respectfully disagree.

Chiang '846 and Azadegan, taken separately or in combination, fail to teach or suggest at least one limitation of claim 4. Claim 4 depends from claim 1 and includes all of the language of claim 1. As explained in section IV, Chiang '846 does not teach or suggest the above-cited language of claim 1. Azadegan describes "re-encoding frames of a digital video stream in which selected areas are designated to have increased or reduced image quality, i.e., decreased or increased quantization levels, respectively, as compared to a previously run automatic encoding process, but without changing the previously calculated bit length of the stream" [Azadegan, Abstract], but Azadegan does not teach or suggest the above-cited language of claim 1.

In view of the foregoing comments, the Applicants will not belabor the merits of the separate patentability of claim 4.

Claim 4 should be allowable.

VII.   Claims 5, 6, 11, 18, and 22-25 should be allowable.

The Office action rejects claim 5, 6, 11, 18, and 22-25 as being unpatentable over Chiang '846 in view of Jacobs. The Applicants respectfully disagree.

The combination of Chiang '846 and Jacobs made by the Examiner to reject claims 5, 6, 11, 18, and 22-25 is improper for several reasons.

First, whereas Jacobs describes a variable rate vocoder [Jacobs, Abstract, 2:51-54], Chiang '846 describes video encoding for a constant capacity channel [Chiang '846, 4:20-24]. Adding variable rate control mechanisms from Jacobs to the constant capacity channel encoding of Chiang '846 changes the principle of operation of Chiang '846, and thus is improper. [MPEP 2143.01: THE PROPOSED MODIFICATION CANNOT CHANGE THE PRINCIPLE OF OPERATION OF A REFERENCE.] Conversely, adding constant capacity control mechanisms from Chiang '846 to the variable rate vocoder of Jacobs changes the principle of operation of Jacobs.

Second, whereas Jacobs describes a *CELP* vocoder for *speech* [Jacobs, 2:57-60], Chiang '846 describes a *spectral* encoder for *video* [Chiang '846, 1:9-10, 7:21-35]. Adding CELP speech vocoder mechanisms from Jacobs to the spectral video encoding of Chiang '846 changes the principle of operation of Chiang '846. Conversely, adding spectral video encoding mechanisms from Chiang '846 to the CELP speech vocoder of Jacobs changes the principle of operation of Jacobs.

Aside from this, Chiang '846 and Jacobs, taken separately or in combination, fail to teach or suggest at least one limitation of each of claims 5, 6, 11, 18, and 22-25.

Each of claims 5 and 6 depends from claim 1 and includes all of the language of claim 1. As explained in section IV, Chiang '846 does not teach or suggest the above-cited language of claim 1. Jacobs describes a vocoder computing the SSD between the current frame's LSP frequencies and previous frame's LSP frequencies, then comparing the resulting value with a threshold value. [Jacobs, 24:17-23.] The SSD value indicates the *extent of change* in LSP frequencies from the previous frame to the current frame. As such, the SSD value in Jacobs measures *similarity* from frame to frame. The SSD value in Jacobs is not a "quality measurement for the block as quantized and reconstructed" as recited in claim 1. Jacobs does not teach or suggest the above-cited language of claim 1. The Applicants will not belabor the merits of the separate patentability of claims 5 and 6. Claims 5 and 6 should be allowable.

Claim 11 depends from claim 10 and includes all of the language of claim 10. Each of claims 18 and 22-25 depends (directly or indirectly) from claim 14, and each includes all of the language of claim 14. As explained in section V, Jacobs does not teach or suggest the above-cited language of claims 10 and 14, respectively. Chiang '846 also does not teach or suggest the above-cited language of claims 10 and 14, respectively. The Applicants will not belabor the merits of the separate patentability of claims 11, 18, and 22-25. Claims 11, 18, and 22-25 should be allowable.

VIII. Claims 8 and 9 should be allowable.

The Office action rejects claim 8 and 9 as being unpatentable over Chiang '846 in view of Mohsenian. The Applicants respectfully disagree.

Chiang '846 and Mohsenian, taken separately or in combination, fail to teach or suggest at least one limitation of each of claims 8 and 9. Each of claims 8 and 9 depends from claim 1 and includes all of the language of claim 1. As explained in section IV, Chiang '846 does not teach or suggest the above-cited language of claim 1. Mohsenian also does not teach or suggest the above-cited language of claim 1. The Applicants will not belabor the merits of the separate patentability of claims 8 and 9. Claims 8 and 9 should be allowable.

IX.   Claims 20 and 21 should be allowable.

The Office action rejects claim 20 and 21 as being unpatentable over Chiang '497 in view of Jacobs. The Applicants respectfully disagree.

The combination of Chiang '497 and Jacobs made by the Examiner to reject claims 20 and 21 is improper. Whereas Jacobs describes a *CELP* vocoder for *speech* [Jacobs, 2:57-60], Chiang '497 describes a *spectral* encoder for *video* [Chiang '497, 3:60-65]. Adding CELP speech vocoder mechanisms from Jacobs to the spectral video encoding of Chiang '497 changes the principle of operation of Chiang '497. [MPEP 2143.01: THE PROPOSED MODIFICATION CANNOT CHANGE THE PRINCIPLE OF OPERATION OF A REFERENCE.] Conversely, adding spectral video encoding mechanisms from Chiang '497 to the CELP speech vocoder of Jacobs changes the principle of operation of Jacobs.

Aside from this, Chiang'497 and Jacobs, taken separately or in combination, fail to teach or suggest at least one limitation of each of claims 20 and 21. Each of claims 20 and 21 depends from claim 14 and includes all of the language of claim 14. As explained in section V, Jacobs does not teach or suggest the above-cited language of claim 14. Chiang '497 also does not teach or suggest the above-cited language of claim 14. The Applicants will not belabor the merits of the separate patentability of claims 20 and 21. Claims 20 and 21 should be allowable.

Conclusion

Claims 1-25 should be allowable. Such action is respectfully requested.

Respectfully submitted,

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